BLUETOOTH-TRIGGERED ALARM SECURITY SYSTEM

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This thesis is submitted as partial fulfillment of the requirements for the award of the Bachelor of Electrical Engineering (Hons.) (Electronics)

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NOVEMBER, 2010

"I hereby acknowledge that the scope and quality of this thesis is qualified for the award of the Bachelor Degree of Electrical Engineering (Electronics)"

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ACKNOWLEDGEMENT

First and foremost, I would like to express my heartily gratitude to my supervisor, Mr Fairuz Rizal Bin Mohamad Rashidi for the guidance, enthusiasm and motivation given throughout the progress of this project. With his full support, this project is accomplished as expected.

My sincere appreciation also goes to my family who has been so tolerant and supports me all these years. Thanks for their encouragement, love and emotional supports that they had given to me.

I would also like to thank all my friends who have directly or indirectly give me a favor at various occasions to complete my project and their support is such an encouragement for me throughout the project. Also not to forget all lecturers and FKEE staff that provides help and support throughout this project development. Their views and tips are useful indeed. Unfortunately, it is not possible to list all of them in this limited space.

ABSTRACT

Security system nowadays become a need for houses or commercial premises and available with many modern features. This Bluetooth-triggered alarm security system comes with extra secure access and intelligent alarming. The system only can be accessed and configured by owner using Bluetooth communication via mobile phone to turn it on or off. In this project, when the alarm is triggered, an intruder alert message will be sent to the neighbor's phone through Bluetooth communication. After the certain time, the alarm system will be triggered and by that time the neighbors have already surrounded the compound and the probability of the intruder to be caught is higher. IR sensor of the system will continuously monitor movement or present of human in the building. The Bluetooth module will sent intruder alert message as microprocessor (PIC) receive signal from IR sensor. The PIC is programmed to wait approximately seven minute before activated the siren. The alarm system status is indicated using LED's to avoid owner accidently turned it off.

ABSTRAK

Sistem keselamatan hari ini menjadi sebuah keperluan bagi sesebuah kediaman mahupun premis komersil dan ianya dilengkapi dengan pelbagai keupayaan serba canggih. Sistem keselamatan pacuan Bluetooth ini didatangkan dengan akses lebih selamat dan mempunyai penanda kecemasan pintar. Sistem ini hanya boleh diakses dan diaktifkan oleh pemilik menerusi Bluetooth dengan menggunakan telefon bimbit untuk menghidupkan atau memadamkan sistem. Di dalam projek ini, apabila peceroboh dikesan, isyarat kecemasan akan dihantar kepada telefon bimbit jiran-jiran menerusi komunikasi Bluetooth. Selepas beberapa ketika masa yang ditetapkan sistem, penanda kecemasan berupa siren akan diaktifkan dan pada masa itu jiran tetangga sudah pun mengepung kawasan yang diceroboh itu yang mana membolehkan penjenayah tertangkap. Penggunaan sensor IR pada system ini akan berterusan mengawasi jika terdapat sebarang kehadiran manusia di dalam bangunan. Modul Bluetooth pula bertindak sebagai perantara menghantar isyarat kecemasan setelah mikropemproses (PIC) menerima isyarat dari sensor IR. PIC ini diprogramkan supaya menunggu lebih kurang tujuh minit sebelum siren diaktifkan. Status system sekuriti ini dipaparkan menggunakan LED bagi mengelakkan pemilik memadamkannya secara tidak sedar.

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LIST OF ABBREVIATIONS

LED	-	Light Emitting Diode
GUI	-	Graphical User Interface
USART	-	Universal Synchronous Asynchronous Receive Transmit
SFR	-	Special function registers
ASCII	-	American Standard Codes for Information Interchange
PIR	-	Passive Infra Red
RFCOMM	-	Radio Frequency Communication
SPP	-	Serial Port Profile
USB	-	Universal Serial Bus
TX/RX	-	Transmint/Receive
PC	-	Personal Computer
GSM	-	Global System for Mobile Communications
PIC	-	Programmable Integrated Circuit
IC	-	Integrated Circuit
ISM	-	Iindustrial Scientific Medical
CPU	-	Central Processing Unit
I/O	-	Input/Output
EEPROM	-	Electrically Erasable Programmable Read Only Memory
ADC	-	Analogue to Digital Converter
TTL	-	Transistor–Transistor Logic
RAM	-	Random Access Memory
ROM	-	Read-Only Memory
DTE	-	Data Terminal Equipments
DCE	-	Data Communication Equipments
PBP	-	PicBasicPro

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CHAPTER 1

INTRODUCTION

1.1 Bluetooth Triggered Alarm Security System

Security system nowadays become a need for houses or commercial premises and available with many modern features. Robbery tends break in premises while the owners are away. Many security systems available in market are not really stable and smart enough to deal with the intruders. As for many security system, loss from robbery and if the criminal got away, it invites unconfident of security reputation. Furthermore, it is crucial to has advanced alarm system which could not only secure the premises, but also increase the chance to capture the criminal.

Additionally, it is significant to have an alarm system which could hardly to hack and conveniently operating in wireless environment. Thus, motion sensor, Bluetooth communication and smart alarming were the features opted into security system. The system only can be accessed and configured by owner using Bluetooth communication via mobile phone to turn it on or off. Meanwhile, if intruder detected, the alarm is triggered and an intruder alert message will be sent to the neighbor's phone through Bluetooth communication. Then, only after certain delayed time, the siren will activated.

1.2 Problem Statement

False alarms, easy to hacks and costly design were the weakness of most security system. Normal motion detectors are capable to distinguish presence of human or animal hence avoid false alarm. More security systems implement this approach to overcome false alarm problem without involving high costs.

Bluetooth communication known to be secure and not require line of sight (LOS) making it invulnerable to hacking tactics. This Bluetooth configuration can be made by certain user that predefined by the system. Unrecognized communication or foreign access will not accepted by the system hence deny any possibilities being hacked. With battery operated and small size, made the system discrete enough from being knocked physically.

Most people hesitate to install security system since it requires expensive equipment and sometimes it have subscription fee. Security system build based on Programmable Integrated Circuit (PIC) will reduce the starting costs. Additionally, Bluetooth module price become less expensive over the time and Bluetooth enabled mobile phone become common in market make the system more affordable. Therefore most residents are able to own the security systems in their premises and install it as fast as possible.

1.3 Objectives

This project aims to produce a security system that operates using PIC and configured using mobile phones via Bluetooth. However, several objectives must be accomplished before reach this goal.

The first objective is to communicate Bluetooth Module and Bluetooth-enabled mobile phones successfully established. It is two way communications, so both devices must able to send and receive data.

Secondly is the Bluetooth Module and motion detector will interface with PIC without any problem. Motion detector and Bluetooth Module are only device attached with PIC and communicates directly.

Finally, is to ensure there is no stability problem in term of hardware and software with all components working together as a system as desired.

1.4 Scope of Project

In order to realize this type of alarm system by considering time constraint and budget, there are several scopes that need to be outlined. This is to ensure the project is heading in the right direction to achieve its intended purpose. This project is proposed under certain defined scopes;

i. Build security system that can be configured using mobile phone through Bluetooth
ii. Only a single user mobile phone can setup the system via Bluetooth
iii. Using only one motion detector, ceiling mounted with detection range of 5m diameter at 2.4m high

Using 16F877 PIC to control system behavior, input and output

CHAPTER 2

LITERATURE REVIEW

2.1 Chapter Overview

This chapter discusses projects and paper works related to this project. These related works have been reviewed carefully in order to improve the quality and reliability of this project. By analyzing the projects did by other researchers, there is a possibility to know what features are lacking in their projects. They also will recommend some future works that could be done to improve the same project. Moreover, there are some useful ideas that can be implemented in this project from other similar projects. Therefore, literature review process extended right from the start until the end of the project.

In this literature review there were source of information for this alarm system with Bluetooth technology. Furthermore they contain information on the in-depth understanding of the Bluetooth technology and also explained how each of various peripherals communicates through Bluetooth communication with various levels of protocols. Since alarm security systems with Bluetooth features are least significant in Malaysia, locally, most of the sources come from foreign on-line journal.

2.2 Related Projects and Articles

2.2.1 Home Security with Bluetooth Technology by Hunseng Chua

This project is meant to prototyping Bluetooth communication into a system. The Bluetooth communication link will be done by using two laptops with Bluetooth stack resides on the Laptop connected with the Ericsson ROK 101007 Bluetooth module via the Universal Serial Bus (USB). The motion detector will be connected to one of the laptop via the serial link (serial cable between the motion detector and the laptop) [2]. Status of the system, connection and detection can be monitored directly in computer screen.

This project had more focus on PIR sensor where the distance of detection is configured and monitored in real time. Despite of having Bluetooth technology, the system drawbacks is not portable since it uses two (2) laptops. However it is good reference of concept and idea for adding Bluetooth enable features to system.

2.2.2 Integrated Networked Security System by Mohd Haaziq Mat Zin

This project was reviewed since it had nearly similar system and hardware to the project being developed. The main concept highlighted is the zone based detection. If the intruder is detected in outside house area the warning light will lit as a precaution. When the intruders enter the house compound which is the medium-risk zone, silent alarm will be sent informing the guard house or nearby neighbor about the situation, finally when the intruders reach inside the house the loud alarm will blare to scare off the intruders [8].

For communication with the security module, two Bluetooth modules are required where one of it from Sparkfun which is called BlueSmirf Gold and another one is Ezurio Bluetooth Intelligent Serial Module II (BISM II). To communicate with personal computer (PC) via Bluetooth link, Bluetooth dongle from Ezurio is used.

This project intended to have multiple connections with the device which may have an issue in connecting device from different manufacturers. Despite on having large detection area it may cause false detection for alarm. Moreover, the absences of remote controlling device degrade its mobility.

2.2.3 SOREX Wireless Solution GesmbH

SOREX Wireless Solution GmbH had commercialized their Bluetooth based alarm security system. Their product was very similar to the project being developed but different in approach. SOREX uses Bluetooth as a key where mobile phone Bluetooth used to open auto gate and magnetic locked doors.

Taking SOREX Wireless Key Basic for example, it uses mobile phone Bluetooth's as access key and registered device can be up to ten (10) phones. As user approach to a door, the mobile communicates automatically with the SOREX module. It is up to user if the door shall open automatically when they approach or push a button as alternative.

Security system developed by SOREX seamlessly advanced as they involves in electronic industries for almost six years. Their Bluetooth technology known to be provides by Bluegiga Technologies using WT11 Bluetooth Module. The product seems to be more passive since it is physical key replacement. There also will be issue on locking function during electricity blackout. SOREX approach style can greatly improve feature for project being developed.

2.2.4 Remote Control from Your Mobile Phone by Richard Hoptroff

Richard Hoptroff, as a development engineer for FlexiPanel Ltd writes this article in Elektor Electronics magazine. He even reviewed several project involving Bluetooth as remote control especially using FlexiPanel products.

Picking one of the projects, Access Controller project is selected. Each user has a separate password, and a log is kept of time and person accordingly. No custom transmitter is needed but any suitable mobile phone or handhelds would do [11]. Relay is used to provide an isolated switch for opening the electric lock. Relay and electric lock usually require high voltage to operate which make the system require supply from main or socket outlet. During electrical blackouts, the system easily vulnerable or in either way user will trap until the supply back on. The other project stated in the article which are Temperature Logger and Robot Controller with Route Tracking strengthen that the two ways communication is possible between Bluetooth Module and Bluetooth enabled mobile phone.

The only barrier is whether other Bluetooth Modules are capable performed same as manufactured by FlexiPanel. This article greatly provides brilliant idea on adding Bluetooth features in application. Several electronic industries start referring concept introduce by Richard Hoptroff in progress for product evolution.

CHAPTER 3

METHODOLOGY

3.1 Chapter Overview

This chapter will discuss the methods and alternatives that have been used from the beginning until the end of this project. Project flow and system overview will be discussed briefly to give more understanding of the design and development concept of this project.

This project involves more in software than hardware in overall. However, hardware part need not to taken lightly as it involves equipment that quite sensitive, expensive and moreover hardly to acquire in Malaysia. Bluetooth Module and Bluetooth enabled mobile phone were the significant examples. To avoid spending too much costs, most hardware were lent from laboratory and lecturers.

Software part hence mostly takes role around Bluetooth communication both at PIC16F877 and mobile phone sides. Mainly, PICBASIC, AT-Commands and IVT BlueSoleil used to develop the software part. Software or programming task had been conveniently done using PC.

3.2 Project Flow

This project starts with hardware development. Hardware provides this project with strong and reliable framework. Hardware involves are not complex in connection and configuration and it was better to determine functionality first to avoid software alteration due to different hardware model. Software was developed accordingly with hardware involves because certain hardware require their own typical programming method.

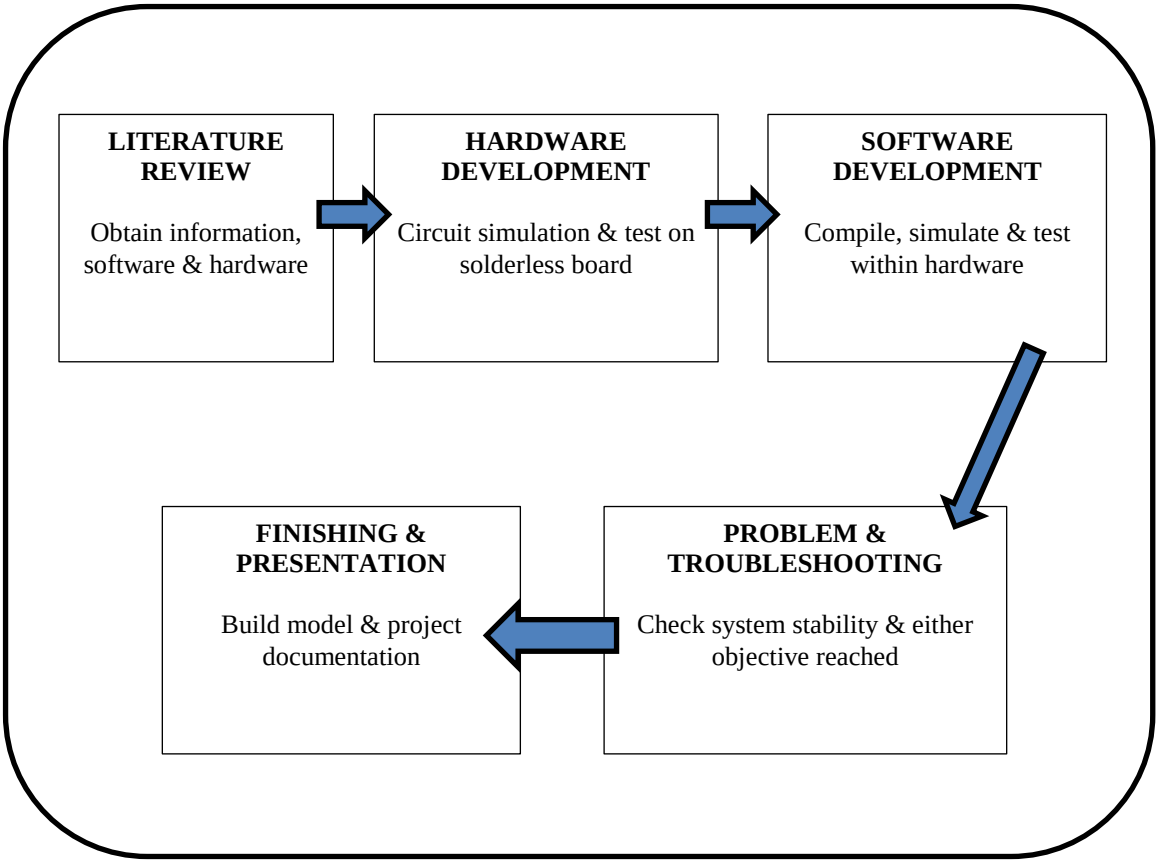

Figure 3.1: Project flow information